

A multi-stage process for removing heteroatoms, particularly organic sulfur and nitrogen components, from liquid petroleum and chemical streams. The feedstream flows countercurrent to the flow of a hydrogen-containing treat gas and is reacted with a first catalyst which is relatively tolerant to sulfur and nitrogen, such as a CoMo supported catalyst. When the level of organic sulfur in the feedstream is less than about 3,000 wppm and the level of organic nitrogen is less than about 1,000 wppm, the feedstream is reacted with said counter flowing hydrogen-containing treat gas in the presence of a catalyst comprised of Ni and a Group VIA metal selected from Mo, W, or both, on a refractory support. The reaction vessel preferably contains vapor and optionally liquid by-pass means in one or more of the catalyst beds.